DOCUMENT RESUME

ED 139 545 PS 009 316

AUTHOR Zelazo, Philip R.; Kearsley, Richard B.
TITLE Functional Play: Evidence for a Cognitive Metamorphosis in the Year Old Infant.
PUB DATE Mar 77
NOTE 15p.; Paper presented at the Biennial Meeting of the Society for Research in Child Development (New Orleans, Louisiana, March 17-20, 1977)

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS *Age Differences; Cognitive Ability; *Cognitive Development; Cognitive Measurement; Early Childhood Education; *Infant Behavior; *Infants; *Play; Psychomotor Skills; *Research Methodology
IDENTIFIERS *Functional Play

ABSTRACT

In this study, free play with toys having unambiguous functions was examined to test the hypothesis that a basic cognitive metamorphosis is associated with the new competences displayed in children at about 12 months. Functional play was observed in 64 children at 9 1/2, 11 1/2, 13 1/2, and 15 1/2 months of age. Six sets of toys with 36 conservatively defined functional uses (ideas) were coded in 10-second blocks over a 15-minute session. Results indicated that functional play (e.g., stirring a spoon in a tea cup, bringing a telephone to one's ear) emerges abruptly at 11 1/2 and increases linearly through 13 1/2 and 15 1/2 months. Indiscriminate mouthing, waving, banging, and fingering of objects is greatest at 9 1/2 months and diminishes linearly. Thus, a stereotypic response repetoire gives way to specific actions reflecting ideas appropriate to specific situations. Results strongly imply that a cognitive metamorphosis (the ability to generate specific ideas) underlies the many changes occurring in the 1-year-old infant. The potential for infant cognitive assessment is discussed. (Author/MS)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED139545

U S DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Functional Play:

Evidence for a Cognitive Metamorphosis in the Year Old Infant

Philip R. Zelazo

and

Richard B. Kearsley

Tufts-New England Medical Center

PS 009316

Paper presented at the Biennial Meeting of the Society for Research in Child Development, New Orleans, March 16-20, 1977.

Functional Play: Evidence for a Cognitive Metamorphosis in the Year Old Infant

Many changes in infant behavior are known to occur towards the end of the first year of life. The onset of the infant's first words (Bayley, 1969), the statistically significant emergence of separation protest (c.f., Zelazo, 1975), and conservation of weight (Mounoud and Bower, 1974) are but a few. Zelazo (1975) has recently suggested that many of these emergent abilities may be traceable to the appearance of a more sophisticated cognitive capacity. Kagan (1971;1972) suggested earlier that this cognitive change enables the child to activate hypotheses and first emerges at about nine months of age. Zelazo (1975) postulated that the operationalization of hypothesis activation represents an ability to activate specific ideas appropriate to specific situations and is not statistically demonstrable until twelve months of age. Both sets of speculations are consistent and were primarily based upon elicited responses to a series of repeated social and non-social visual and auditory events. Two findings in particular, imply a possible cognitive metamorphosis. First, fixation to these repeated sequential, perceptual-cognitive stimuli increases over the first year. Because the stimuli do not change, it appears that the child may bring an increasing level of cognitive competence to the situation as he gets older. Secondly, assimilation of changes in these complex sequential events, as inferred from a cluster of responses including cardiac deceleration, smiling, and vocalizing while attending, does not emerge until 11½ months of age. These reactions to carefully controlled perceptual-cognitive events appear to correlate with the many behavioral changes presumed to occur around 12 months of age.

These considerations prompted us to examine the child's ability to generate specific ideas toward the end of the first and the beginning of the second year of life, and led to the examination of that aspect of play in which unambiguous ideas could be identified and their occurrence documented.

METHOD

Subjects and Design. Sixty-four infants, eight boys and eight girls at each of four ages: 9½, 11½, 13½, and 15½ months were observed during a fifteen minute free play situation. All children were capable of independent locomotion, either by crawling or walking. Sex of the child and age were the principal variables in the design with three, five minute trial trial blocks as a repeated measure. There were six sets of toys divided into three categories - male, female, and neutral - that were also examined as a repeated measure, but will not be reported here.

Materials. The six sets of toys included twenty-eight individual items: a tea set with pot, cover, two cups, saucers, and spoons; telephone; small unisex doll with furniture; large baby doll with dress, socks, shoes, brush and bottle; plastic dump truck, blocks and garage; and a baseball, bat, glove and hat. Thirty-six specific functions representing conservatively selected ideas appropriate to each set of toys were defined a priori. For example, stirring a spoon in a tea cup, babbling into a telephone, placing the truck (wheels down) along the floor, and brushing the doll's hair were considered functional play.

Measures. Four mutually exclusive classes of play were defined. The occurrence of each type of play was recorded for ten second intervals over the entire fifteen minute session using a check list. The first category was undifferentiated play in which an object was simply held and observed. The second play measure was stereotypical responding and included mouthing, fingering, waving, and/or banging of a toy. The third measure was relational play defined as the simultaneous association of two or more objects in a non-functional manner exclusive of stereotypic responding. The fourth measure, and the one of greatest concern in this particular paper, was functional play in which the child used toys according to their adult

defined purposes. Thus, functional, relational, and stereotypical play were mutually exclusive categories whose incidences, scored over ten second blocks, served as the fundamental units for statistical analyses. The residual category, undifferentiated play, was not analyzed statistically.

Procedures. Mother and child were brought into a carpeted, twelve foot by eighteen foot room adjacent to a twelve foot observation room. The first slide illustrates the display of toys from the mother's perspective.

Insert Slide 1 here

Toys were arranged in a prescribed order along a semi-circle, five feet in front of the mother's chair. The session began with the mother placing the child on the floor within reach of the toys saying, "Look at all the toys! Go play with the toys". Mother was asked to remain seated, read a magazine and refrain from initiating interaction, but to respond naturally to her child if he initiated interaction. The child's play was recorded from the adjacent observation room.

RESULTS

The principal findings were the highly significant age main effects for the three types of play - stereotypical ($F\ 3/56 = 7.96$, $P < .001$), relational ($F\ 3/56 = 4.75$, $P < .005$), and functional ($F\ 3/56 = 15.43$, $P < .001$) responding. Not only was the prediction that functional play would appear at 11½ months confirmed, but each of the play indices helps to clarify the dramatic and remarkably clear changes occurring over the six month period from 9½ through 15½ months of age. Indiscriminate mouthing, fingering, waving, and banging of objects - dominant at 9½ months - is replaced by relational play as the dominant mode at 13½ months which in turn is replaced by functional play as the primary activity at

15½ months.

The transition from indiscriminate stereotypical to relational to functional use is illustrated in the second slide in which the measures

Insert Slide 2 here

are converted to mean percentages of the mean sum of play at each age. The effects displayed in this slide are faithful - almost identical-to the highly significant effects obtained with the analyses of the ten second units. It can be seen from the values at the bottom of the slide that the average amount of play, consisting of the four types outlined earlier, is relatively constant over age. Undifferentiated play - the fourth type - is omitted from the slide because it is relatively uninformative.

It can also be seen that stereotypical responses declined sharply over the four ages, from 51% at 9½ months to 25 at 11½, 23 at 13½, and 15% at 15½ months (linear trend, $P < .01$). The declines between 9½ and 11½ months and 13½ and 15½ months were statistically different (Tukey Test, both P's $< .01$). Mouthing, fingering, waving, and banging were replaced by more specific manipulations during this six month period.

An examination of relational play sheds some light on the transition from stereotypical to functional manipulation. Unlike the other two measures, relational play was curvilinear over age - implying a transitory function. Eleven percent of play at 9½ months was relational reflecting an earlier onset than functional play. This disposition to put two objects together in a non-functional manner increased to 21% at 11½ months, reaching a maximum of 32% at 13½ months. At 15½ months, relational play declined to 20% of the total. Subsequent comparisons indicate that increases from 9½ to 11½ to 13½ months and the decrease from 13½ to 15½ months are statistically significant (Tukey Test, all P's $< .01$). The remarkable

consistency of this inverted U function can be seen in the next slide

Insert Slide 3 here

illustrates the Time X Age Interaction which has a significant quadratic component ($F\ 3/56 = 5.52$, $P. < .002$).

The mean number of ten seconds units plotted over three, five minute blocks for each age indicates that the quadratic effect extends over the fifteen minute test sessions. Relational play is lowest during the first five minutes at 9½ months and increases steadily over sessions and ages, peaking during the middle of the 13½ month session. Beyond this point, relational play declines steadily over five minute periods through the last five minutes of the 15½ month testing. By 15½ months, there is more functional than relational play.

The most important finding in the data depicted in the second slide is the onset of functional play -- the unambiguous display of ideas at 11½ months of age. It can be seen that functional play increases linearly over age from near zero percent at 9½ months to 7 percent at 11½ months, to 25 percent at 13½ months and peaking at 36 percent at 15½ months (linear trend, $P < .01$). Comparisons of the increases at each of the ages, i.e., 9½ vs. 11½, 11½ vs. 13½, and 13½ vs. 15½, were all statistically significant (Tukey Test, all P's $< .01$).

The number of ideas expressed in functional play also appears abruptly at 11½ months and increases linearly over age ($P < .001$). Analysis of the number of objectively defined functional hypotheses displayed at each of the four successive ages confirmed the marked linear increase obtained for the ten second units ($F\ 3/56 = 37.64$, $P < .001$). The means were .38, 2.62, 7.88, and 10.38.

There was a linear effect for time blocks ($F\ 1/56 = 13.98$, $P < .001$)

indicating a clear decline in functional play over the fifteen minute sessions. Apparently, children were more likely to display their functional knowledge at the beginning of each session; they get in and do what they know first. It should be added that there were no sex differences except for category and these will not be discussed.

These data strongly reflect the change from indiscriminate stereotypical responding and emergent relational play at 9½ months to the first statistically significant appearance of functional play at 11½ months announcing the onset of the capacity to generate specific ideas for specific situations. This is by far the most important result in these data. A description of the phenomenon may help to make this occurrence more meaningful. The 9½-month-old infant typically picks up the telephone and puts it in his mouth; at 11½, 13½ and 15½ months, he is increasingly more likely to put the telephone to his ear and babble. Or, if playing with the tea set, the 9½-month-old infant will bang the toy spoon against the side of the tea cup or tea pot, whereas the older child will be more likely to stir imaginary tea, drink from the cup and correctly put the lid on the pot. The 9½-month-old appears to lack the cognitive capacity to generate the specific uses associated with each of the toys, but it appears that only two months later he is much more likely to display that capacity. It is also clear that the development from indiscriminate stereotypical responding to the display of specific functional uses is bridged by relational play which appears to be a transitional phenomenon.

DISCUSSION

To summarize, these data strongly support the argument that between 9½ and 11½ months a cognitive metamorphosis occurs that permits the child to generate specific ideas appropriate for specific situations. The motoric dexterity and locomotion necessary for accomplishing the stereotypic and

relational acts displayed at 9½ months are sufficient for the execution of functional play at 11½ months. The neuromotor coordination necessary for stereotypic responding and for relational play is comparable to that involved in functional play and implies that the critical change over this two month period is cognitive in origin.

The postulation of an underlying cognitive metamorphosis gains its greatest support from the face validity inherent in functional play. It is difficult to dispute the suggestion that stirring imaginary tea or brushing a doll's hair reflects a specific idea appropriate to a specific situation. The child does not brush the truck, or put the bat to his ear and babble. Moreover, these results offer a powerful explanatory basis for a number of important developments that include the onset of separation distress, the child's first spoken words, and the specificity inherent in the conservation of weight - each of which occurs at about twelve months of age. For example, in producing the first spoken word, the child displays the ability to generate a unique vocal utterance (e.g., ball) that corresponds to a specific object in his world.

Finally, the specification of a cognitive metamorphosis during the narrowly defined period indicated by these results bears clinical implication. The child's display of functional uses is relatively easy to elicit and can serve as positive evidence that he has surpassed the cognitive transition occurring around twelve months of age. Functional play has particular utility when a child is either not speaking, not ambulatory, or uncooperative. If the capacity to generate specific ideas for specific situations underlies many of the year-old-infants' performances, then there are many ways to assess this basic capacity. Free play represents one approach that

makes minimal demands on the child and therefore, increases the probability of success. As a clinical measure, functional play may not only indicate whether a child entered a new cognitive domain, but may also offer a glimpse of the extent and richness of his cognitive world.

References

Bayley, N. Bayley Scales of Infant Development, New York: The Psychological Corporation, 1969.

Kagan, J. Change and continuity in infancy, New York: Wiley, 1971.

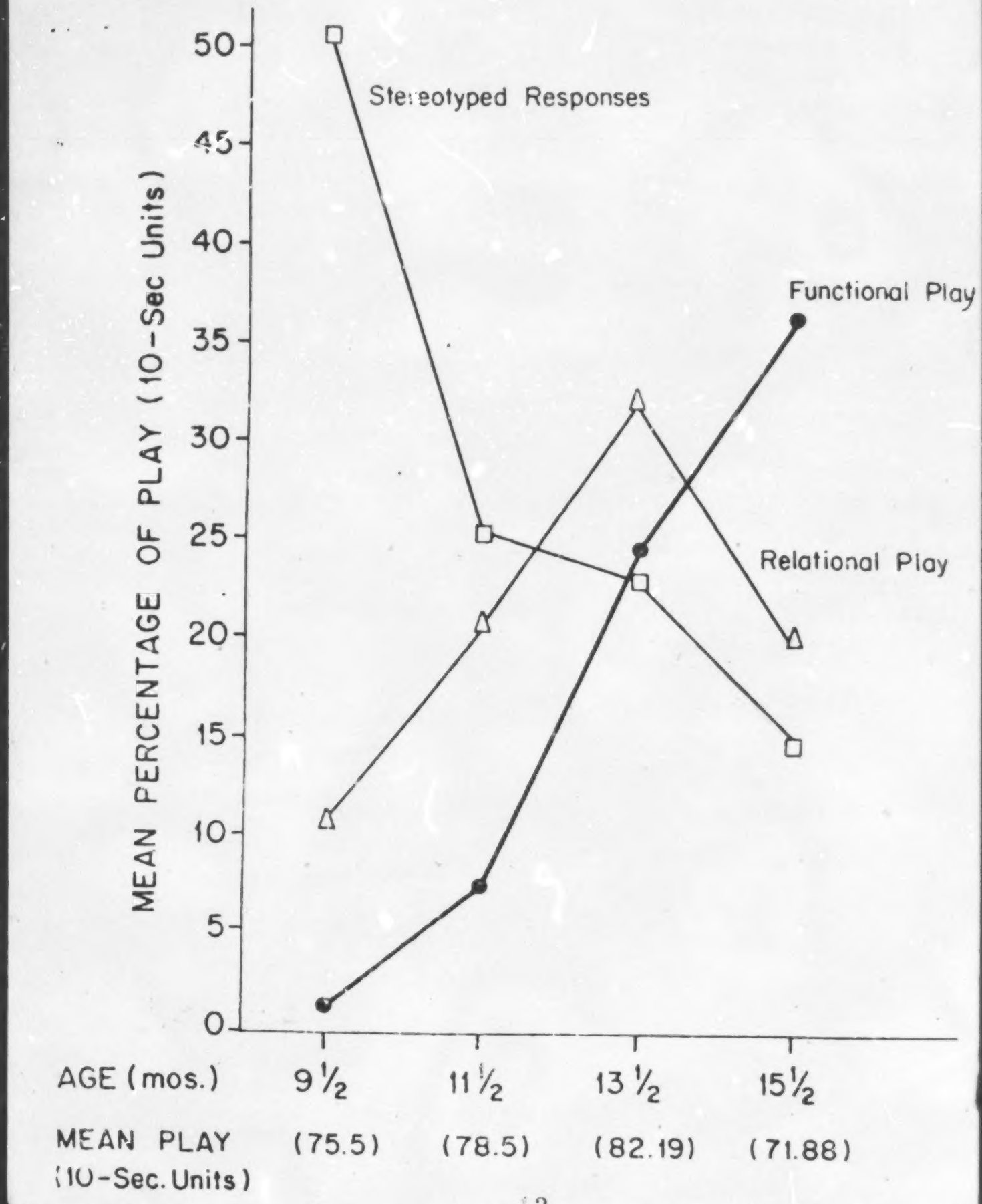
Kagan, J. Do infants think? Scientific American, 1972, 226, 74-82.

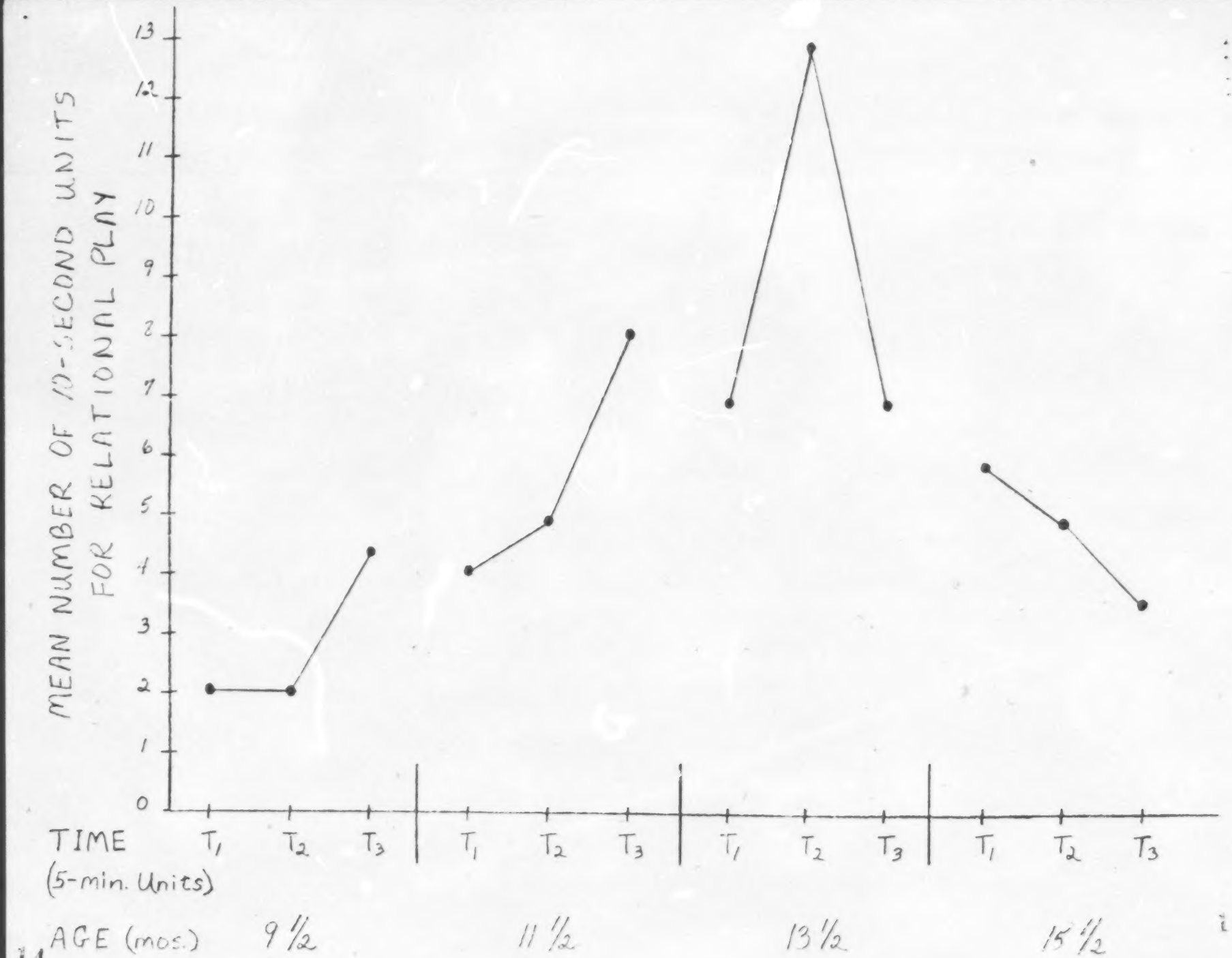
Mounoud, P., & Bower, T.G.R. Conservation of weight in infants. Cognition, 1974.

Zelazo, P.R. The year old infant: A point of major cognitive change. Paper presented at the conference on "Dips" in Learning and Development Curves: Organization for Economic Cooperation and Development. St.-Paul-de-Vence, France, March 23-28, 1975.

List of Figures

1. Display of functional toys (omitted)
2. Percentages of stereotypical, relational, and functional play at each of four ages.
3. Time X Age Interaction reflecting a quadratic effect for relational play.


MEAN PERCENTAGE OF PLAY (10-Sec Units)
50
45
40
35
30
25
20
15
10
5
0
Stereotyped Responses
Functional Play
Relational Play
AGE (mos.)
9 1/2
11 1/2
13 1/2
15 1/2
MEAN PLAY (10-Sec. Units)
(75.5)
(78.5)
(82.19)
(71.88)


MEAN NUMBER OF 10-SECOND UNITS FOR RELATIONAL PLAY
13
12
11
10
9
8
7
6
5
4
3
2
1
0
TIME (5-min. Units)
T1 T2 T3 T1 T2 T3 T1 T2 T3 T1 T2 T3
AGE (mos.)
9 1/2
11 1/2
13 1/2
15 1/2